

**AMENDMENTS TO THE DRAWINGS:**

Subject to the approval of the Examiner, Applicants propose to amend Figures 1-8 as indicated on the annotated drawing replacement sheet labeled Replacement Sheets 1/7 through 7/7 attached hereto.

**Attachments:**

Replacement Sheets 1/7 through 7/7, including Figures 1-8  
Annotated Sheet showing changes to Figures 1-8

**REMARKS**

In the Office Action dated April 17, 2006,<sup>1</sup> the Examiner objected to the specification because the title is allegedly not descriptive; objected to the drawings; rejected claim 20 under 35 U.S.C. § 101 because the claimed invention is allegedly directed to non-statutory subject matter; rejected claim 12 under 35 U.S.C. § 112, second paragraph; and rejected claims 1-20 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,633,856 to Richardson et al. (“Richardson”).

Applicants have amended the title and specification; amended Figures 1-8; and amended claims 1-5, 7, 12, 13, 19 and 20. Claims 1-20 remain pending.

Though Applicants disagree with the Examiner’s objection to the title, Applicants have amended the title to read: “Decoding Method, Decoding Apparatus, and Program to Decode Low Density Parity Check Codes.”

Applicants respectfully request reconsideration and withdrawal of the objection to the drawings. The drawings comply with 37 C.F.R. § 1.83(a) because Applicants have amended Figures 1-8 as suggested by the Examiner on page 2 of the outstanding Office Action. Specifically, Applicants have amended Figures 1-8 to include the label “Prior Art.”

Applicants respectfully traverse the rejection of claim 20 under 35 U.S.C. § 101, as allegedly directed to non-statutory subject matter. To advance prosecution, however, Applicants have amended claim 20 to recite in-part “[a] computer readable medium having a program for causing a computer to perform a decoding method for

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<sup>1</sup> The Office Action may contain statements characterizing the related art, case law, and claims. Regardless of whether any such statements are specifically identified herein, Applicants decline to automatically subscribe to any statements in the Office Action.

use with a decoding apparatus for decoding Low Density Parity Check (“LDPC”) codes....” Thus, because claim 20 is directed toward statutory subject matter, Applicants respectfully request the Examiner withdraw the rejection of claim 20 under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

Applicants respectfully traverse the rejection of claim 12 under 35 U.S.C. § 112, second paragraph. To advance prosecution, however, Applicants have amended claim 12 as indicated by the Examiner on page 3 of the Office Action.

Applicants respectfully traverse the rejection of claims 1-20 under 35 U.S.C. § 102(b) as being anticipated by *Richardson*. To properly establish that a prior art reference anticipates a claimed invention under 35 U.S.C. § 102, each and every element of the claims in issue must be found, either expressly described or under principles of inherency, in the single prior art reference.

Applicants submit that independent claim 1 is not anticipated by *Richardson* because the reference fails to teach each and every claim element of the claim. In particular, *Richardson* at least fails to disclose a decoding method that, for example, “obtain[s] a transformation check matrix by performing at least one of a row permutation and a column permutation on an original check matrix,” as recited in amended independent claim 1.

*Richardson* discloses:

Copies of the smaller graph are subject to a controlled permutation operation to create the larger graph structure. The same controlled permutations are directly implemented to support message passing between the replicated copies of the small graph....The graph permutation operation may be implemented by simply reordering messages,

e.g., using a cyclic permutation operation, in each set of messages read out of a message memory so that the messages are passed to processing circuits corresponding to different copies of the small graph. *Richardson*, abstract (emphasis added).

According to *Richardson*, cyclic permutation operation refers to reordering within the vector edges. See *Richardson*, col. 8, lines 65-67; col. 9, lines 1-2. The permutations, or reorderings, of the vector edges occurs between copies of the projected path as the copies go, e.g., from the variable node side to the constraint node side so as to interconnect Z numbers of copies of the projected graph in a controlled manner. *Id.* at col. 8, lines 47-59. Thus, though *Richardson* discloses cyclic permutation, *Richardson* does not use cyclic permutation to obtain the permutation matrix. Instead, *Richardson* is silent with respect to how the permutation matrix is obtained, except to say that “there are three possibilities for the cyclic permutation matrix used in Fig. 13” and “[i]t is possible to indicate the particular permutation matrix to be substituted for an identity matrix by indicating whether the permutation matrix has a ‘1’ located in the first, second or third position in the first row of the permutation matrix.” *Richardson*, col. 21, lines 53-64. Substituting the particular permutation matrix for an identity matrix does not constitute the claimed “performing at least one of a row permutation and a column permutation on an original check matrix.” *Richardson*, therefore, fails to teach or suggest a decoding method that, for example, “obtain[s] a transformation check matrix by performing at least one of a row permutation and a column permutation on an original check matrix,” as recited in amended independent claim 1.

In view of the foregoing, Applicants submit that amended independent claim 1 is allowable over *Richardson*. Accordingly, Applicants request reconsideration and withdrawal of the rejection under 35 U.S.C. § 102(b) based on *Richardson*.

Independent apparatus claim 4 and independent computer medium claim 20, while of different scope than independent method claim 1, recite subject matter similar to that of independent claim 1 already discussed. Independent claims 4 and 20, therefore, are allowable at least for the reasons presented above for independent claim 1. In addition, claims 2, 3, and 5-19 are allowable at least because of their respective dependence from independent claims 1 and 4.

With respect to claim 6, *Richardson* fails to disclose a decoding apparatus including, for example, “check node calculation means for simultaneously performing p check node computations” and “variable node calculation means for simultaneously performing p variable node computations,” as recited in claim 6.

*Richardson* discloses that “[s]ince the decoding techniques of the present invention allow for a large number of decoding operations...to be performed in parallel, the decoders of the present invention can be used to decode received words at high speeds.” *Richardson*, col. 11, lines 12-17. *Richardson* also discloses “performing both variable node and constraint node processing operations...at the same, e.g., simultaneously and independently.” *Richardson*, col. 24, lines 37-41 (emphasis added). Performing both variable node and constraint node processing operations “simultaneously,” as disclosed by *Richardson*, merely means that the variable and constraint node vector processors perform their respective processing operations at the same time as each other. Such teachings, however, do not indicate that either of the

processors, individually, performs  $P$  number of node vector computations simultaneously, let alone either “simultaneously performing  $P$  check node computations” or “simultaneously performing  $P$  variable node computations.” *Richardson*, therefore, fails to disclose a decoding apparatus including, for example, “check node calculation means for simultaneously performing  $p$  check node computations” and “variable node calculation means for simultaneously performing  $p$  variable node computations,” as recited in claim 6.

In view of the foregoing, Applicants submit that claim 6 is allowable over *Richardson*. Accordingly, Applicants request reconsideration and withdrawal of the rejection based on *Richardson*. Furthermore, in addition to being allowable based on their dependence from independent claim 4, claims 7-17 are allowable at least based on their dependence from claim 6.

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: July 17, 2006

By: Patrick Miller  
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Replacement Sheets 1/7 through 7/7, which include Figures 1-8 (7 pages)  
Annotated Sheets showing changes to Figure 1-8 (7 pages)



FIG. 1 - Prior Art

$$H = \begin{bmatrix} & & & \vdots & & \\ & \cdots & 1 & \cdots & 1 & 1 & \cdots & \cdots & 1 & \cdots & 1 & \cdots & 1 \\ & & & \vdots & & \\ & & & 1 & & \\ & & & \vdots & & \\ & & & 1 & & \end{bmatrix}$$

FIG. 2 - Prior Art

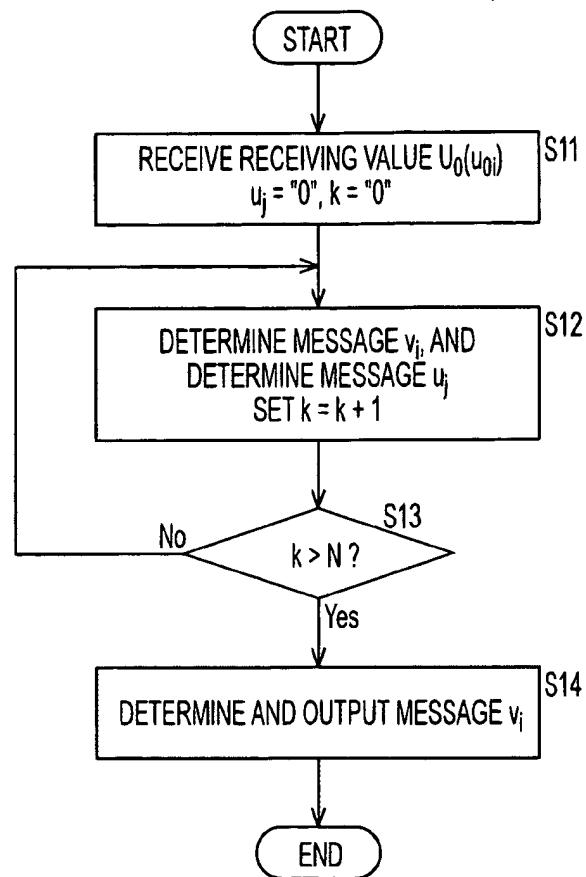
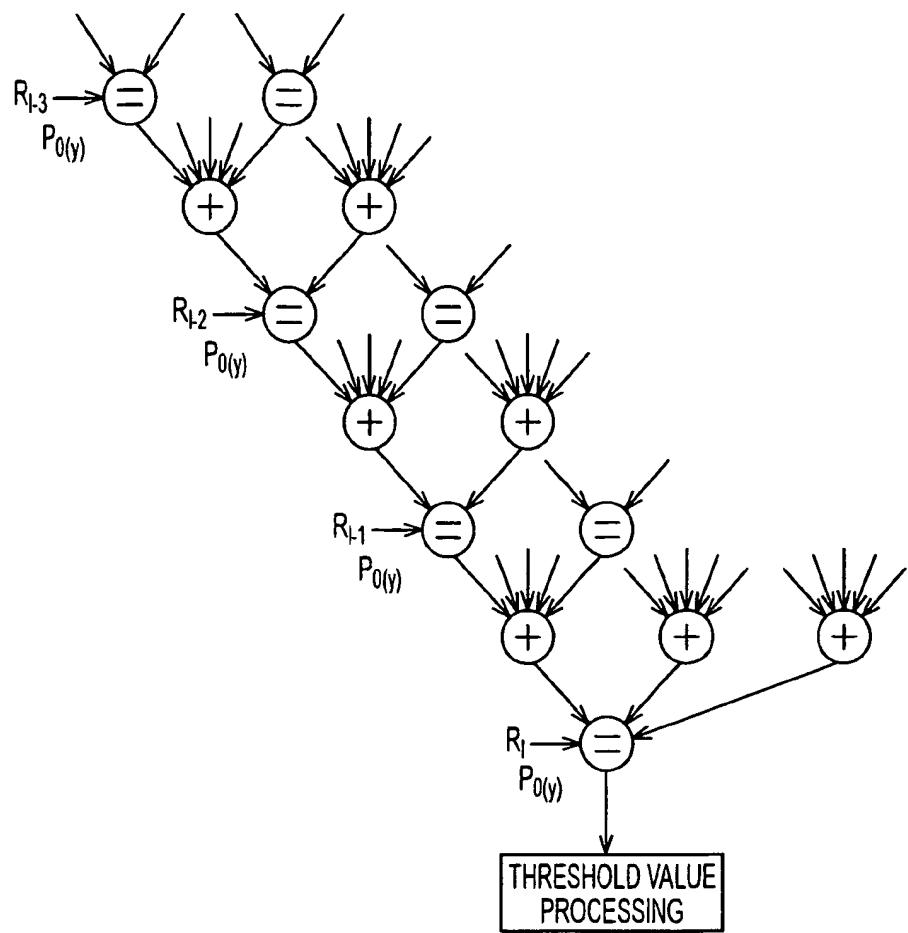


FIG. 3 - Prior Art



Replacement sheet 4/7

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FIG. 4 - Prior Art

$$H = \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 & 1 \end{bmatrix}$$

FIG. 5 - Prior Art

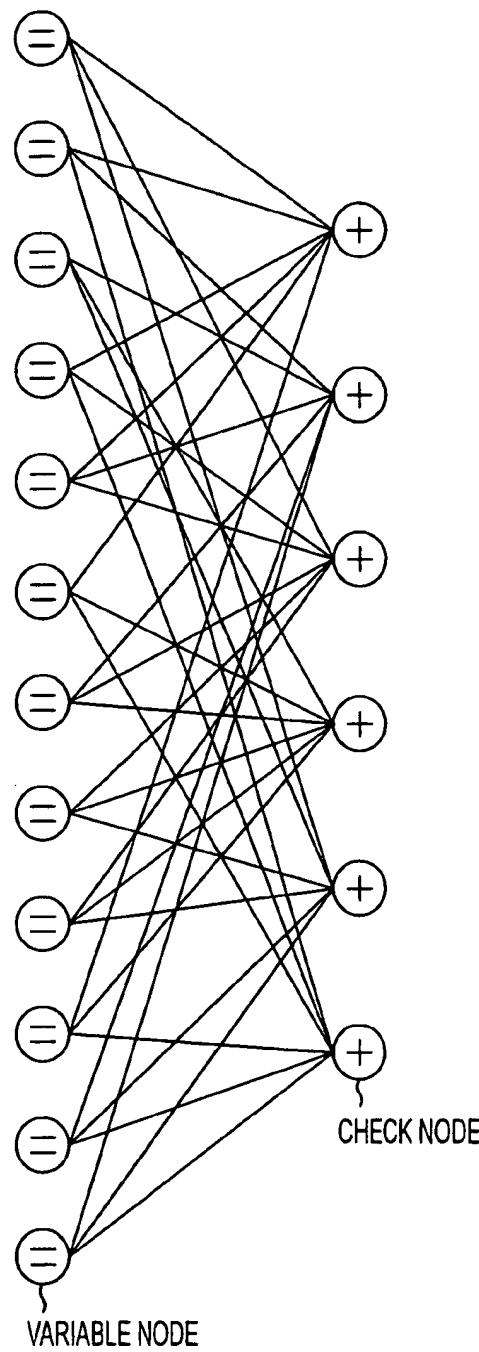


FIG. 6 - Prior Art

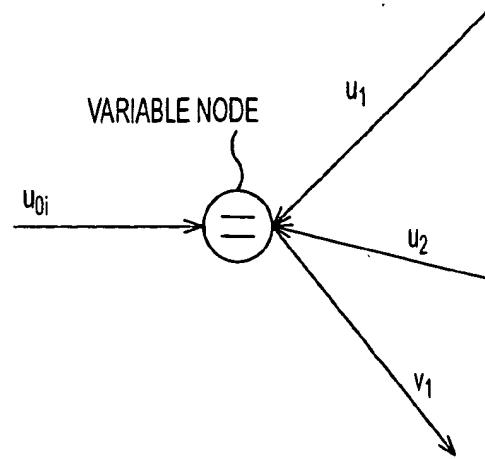


FIG. 7 - Prior Art

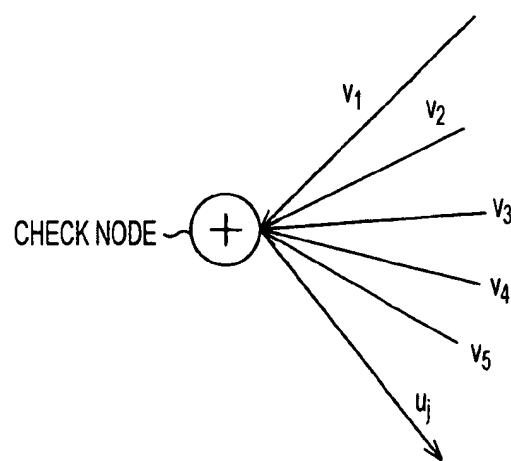


FIG. 8 - Prior Act

